CSC14003 – Artificial Intelligence
PROJECT 02: LOGICAL AGENT

1. Project description

The purpose of this project is to design and implement a ***logical agent*** that navigates through the Wumpus World, a partially-observable environment.

The Wumpus World presents the following key features:

- The environment is an underground cave with a network of interconnected two-dimensional rooms.
- A room may contain a *deadly **pit***, signaled by a perceivable ***breeze***, or a *fatal **Wumpus monster***, detectable via a discernible **stench**.
    - The agent will die immediately when entering a room containing one of those harmful factors. No withdrawal is possible,
    - The percepts are available in the *four-neighborhood of the room* containing one of those harmful factors.
- The agent has an ***arrow*** to shoot in the direction he is facing.
- There is one ***chest of gold***, located somewhere in the cave.
- Movement options: *forward, backward, left, or right by 90 degrees*.

The primary objective encompasses locating the gold. During the journal, the agent may need to kill Wumpus to pursuit success in this environment.

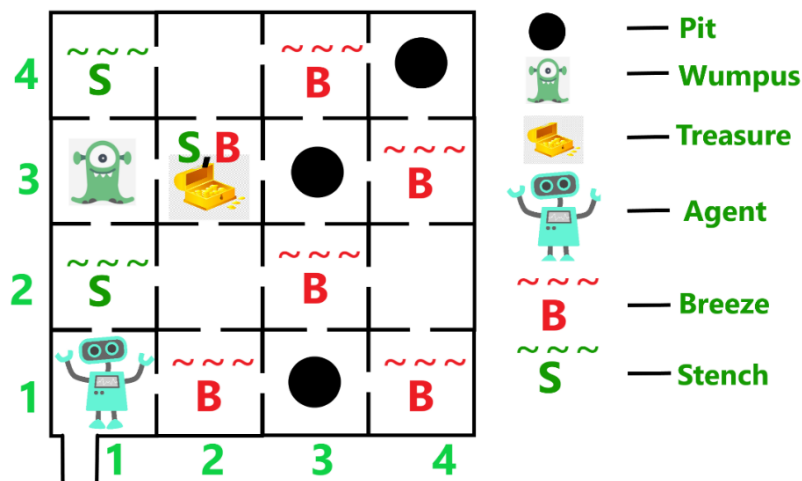Figure 1 demonstrates an example of the Wumpus world with key entities.

Figure 1. An example of the Wumpus world with key entities.

2. Wumpus World

Our Wumpus World for actual implementation slightly differs from the original problem description. The environment's specification is as follows.

- The world will be limited in a grid of 10×10 rooms, instead of the 4×4 one.
  - o The coordinate of a room is represented as a pair of (x, y) values, in which x is the position in the horizontal axis (increasing from left to right) and y is the position in the vertical axis (going from top to bottom).
  - o Room (1, 1) is the bottom-left one, while room (10, 10) the top-right one.
- Agent can start at any room (x, y) and he always faces to the right. This room is the only room that has the entrance to exit the cave.
- There may be any number of pits and chests of gold in the world.
- There is at least one Wumpus.
- The agent carries an infinite number of arrows.
- The game will end when one of the following three conditions occurs:
  - o The agent dies.
  - o The agent kills all of the Wumpus AND grabs all the chests of gold.
  - o The agent climbs out of the cave.

The following activities can give the agent certain amounts of points.

Activity	Points
Pick up each chest of gold	+ 100
Shoot an arrow	− 100
Killed by the Wumpus or Fall into a pit	− 10,000
Climb of the cave	+ 10
Move from one room to an adjacent room	− 10

3. Tasks

Your group must set up a program to explore the Wumpus world and get the highest score possible for that world, using either Propositional Logic or First-Order Logic (or both).

Your implementation should *output information about the search*, including the *percepts at every room the agent enters*, the *updates in the knowledge base after each new percept*, and the *action decided upon by the agent*. The program should also *output the score of the agent*.

Having your implementation generate worlds randomly can help you test your agent.

4. Specifications

Input: the given map is represented by matrix, which is stored in the input file, for example, map1.txt. The input file format is described as follows:

- The first line contains an integer N, which is the size of map.
- N next lines with each line represents a string. If room empty, it is marked by hyphen character (-). If room has some things or signal such as Wumpus(W), Pit(P), Breeze(B), Stench(S), Agent(A) or Gold(G). Between two adjacent rooms is separated by a dot (.)
- For example: -.BS.W.BS.P.B.-.-.-.-

	BS	W	BS	P	B				

Output: a result with path for agent, game point will be displayed on screen and/or written in output text file such as result1.txt.

5. Requirements

No.	Specifications	Scores
1	Finish problem successfully.	50%
2	Graphical demonstration of each step of the running process. You can demo in console screen or use any other graphical library.	10%
3	Generate at least 5 maps with difference structures such as position and number of Pit, Gold and Wumpus.	20%
4	Report your algorithm, experiment with some reflection or comments.	20%
Total		100%

6. Notice

This assignment will be completed in **groups**, as registered at the beginning of the course. To prepare, you will need to create a folder that contains various subfolders, including source, input, output, and document. The report must give the following information:

- Your detailed information (Student Id, Full Name)
- Assignment Plan
- Environment to compile and run your program.
- Estimating the degree of completion level for each requirement.
- References (if any)

Your team can use any programming language to be, but Python is encouraged

Any plagiarism, tricks, or any lie will have 0 points for the course grade.